CLAIMS

What is claimed:

1. A nanodiamond tool, comprising a mass of sintered nanodiamond particles, said mass containing greater than about 95% by volume nanodiamond and greater than about 98% by volume carbon.

2. The nanodiamond tool of claim 1, wherein said nanodiamond particles are self-sintered.

3. The nanodiamond tool of claim 1, said mass further comprising in situ grown nanocrystalline diamond.

4. The nanodiamond tool of claim 3, wherein the in situ grown nanocrystalline diamond is grown from a fullerene carbon source.

5. The nanodiamond tool of claim 1, wherein said mass consists of carbon.

6. The nanodiamond tool of claim 1, wherein the nanodiamond particles have an average diameter of from about 1 nm to about 500 μm.

7. The nanodiamond tool of claim 6, wherein the nanodiamond particles have an average diameter of from about 1 nm to about 100 nm.

8. The nanodiamond tool of claim 7, wherein the nanodiamond particles have an average diameter of from about 2 nm to about 30 nm.

9. The nanodiamond tool of claim 1, wherein the nanodiamond particles have an average crystal size of from about 1 nm to about 20 nm.

10. The nanodiamond tool of claim 1, wherein the nanodiamond particles are randomly oriented.

11. The nanodiamond tool of claim 1, further comprising a substrate attached to the mass of sintered nanodiamond particles.

12. The nanodiamond tool of claim 11, wherein the substrate comprises a layer of at least micron-sized diamond particles bonded together by a metal binder, and a support layer bonded to the layer of at least micron-sized diamond particles.

13. The nanodiamond tool of claim 12, wherein the at least micron-sized diamond particles have an average particle size of from about 0.1 μm to about 100 μm.

14. The nanodiamond tool of claim 12, wherein the metal binder comprises a member selected from the group consisting of nickel, iron, cobalt, manganese, and mixtures or alloys thereof.

15. The nanodiamond tool of claim 11, wherein the substrate comprises a member selected from the group consisting of tungsten, titanium, cemented tungsten carbide, cermets, ceramics, and composites or alloys thereof.

16. The nanodiamond tool of claim 1, wherein said nanodiamond tool is stable at temperatures up to from about 700 °C to about 1,000 °C.

17. The nanodiamond tool of claim 1, wherein said nanodiamond tool is a member selected from the group consisting of cutting tools, drill bits, and wire drawing dies.

18. The nanodiamond tool of claim 1, wherein said nanodiamond tool is a heat spreader.

19. The nanodiamond tool of claim 1, wherein said nanodiamond tool is a surface acoustic wave filter.

20. The nanodiamond tool of claim 1, wherein said nanodiamond tool is a radiation window.

21. A method of forming a nanodiamond tool, comprising the steps of:

a) assembling a mass of nanodiamond particles; and

b) sintering the mass of nanodiamond particles to form a sintered mass, said sintered mass containing greater than about 95% by volume nanodiamond particles and greater than about 98% by volume carbon.

22. The method of claim 21, wherein said mass of nanodiamond particles consists essentially of nanodiamond particles up to the step of sintering, such that the sintered mass is self-sintered.

23. The method of claim 21, wherein the step of assembling a mass of nanodiamond particles further comprises mixing a fullerene carbon source with the nanodiamond particles.

24. The method of claim 21, wherein said sintered mass contains greater than about 99% by volume nanodiamond particles.

25. The method of claim 21, wherein said sintered mass consists of carbon.

26. The method of claim 21, further comprising the step of disposing a first layer of at least micron-sized diamond adjacent the mass of nanodiamond particles prior to sintering.

27. The method of claim 26, wherein the layer of at least micron-sized diamond further comprises a metal binder.

28. The method of claim 27, wherein the metal binder comprises a member selected from the group consisting of nickel, iron, cobalt, manganese, and mixtures or alloys thereof.

29. The method of claim 26, further comprising the step of including a first support material adjacent to the layer of at least micron-sized diamond prior to the step of sintering.

30. The method of claim 29, wherein the first support material comprises a member selected from the group consisting of tungsten, titanium, cemented tungsten carbide, cermets, ceramics, and composites or alloys thereof.